

## CHASING *NEPENTHES* ON CAPE YORK, QUEENSLAND

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Little is known of the distribution, status and systematics of *Nepenthes* in the Austro-Papuan region and there is some confusion about the number of species present (Clarke & Kruger 2006). A project currently being conducted by staff and students of the Australian Tropical Herbarium and James Cook University in Cairns, Queensland and Monash University, Sunway Campus, Kuala Lumpur, Malaysia, is seeking to redress the situation. The study area extends from northern Queensland across the lowlands of the Trans-Fly Ecoregion in Papua New Guinea and West Papua, Indonesia, in the area south of Young's Line. This line delineates the northern margin of the Australia plate and the area is often contiguous when sea levels are lower, most recently c. 8000 years BP (see Figure 1).

This is a report on a recent field trip by PhD candidate Gary Wilson and staff Fanie Venter and Robyn Wilson to Cape York to familiarize themselves with the taxa and habitat of *Nepenthes* there,

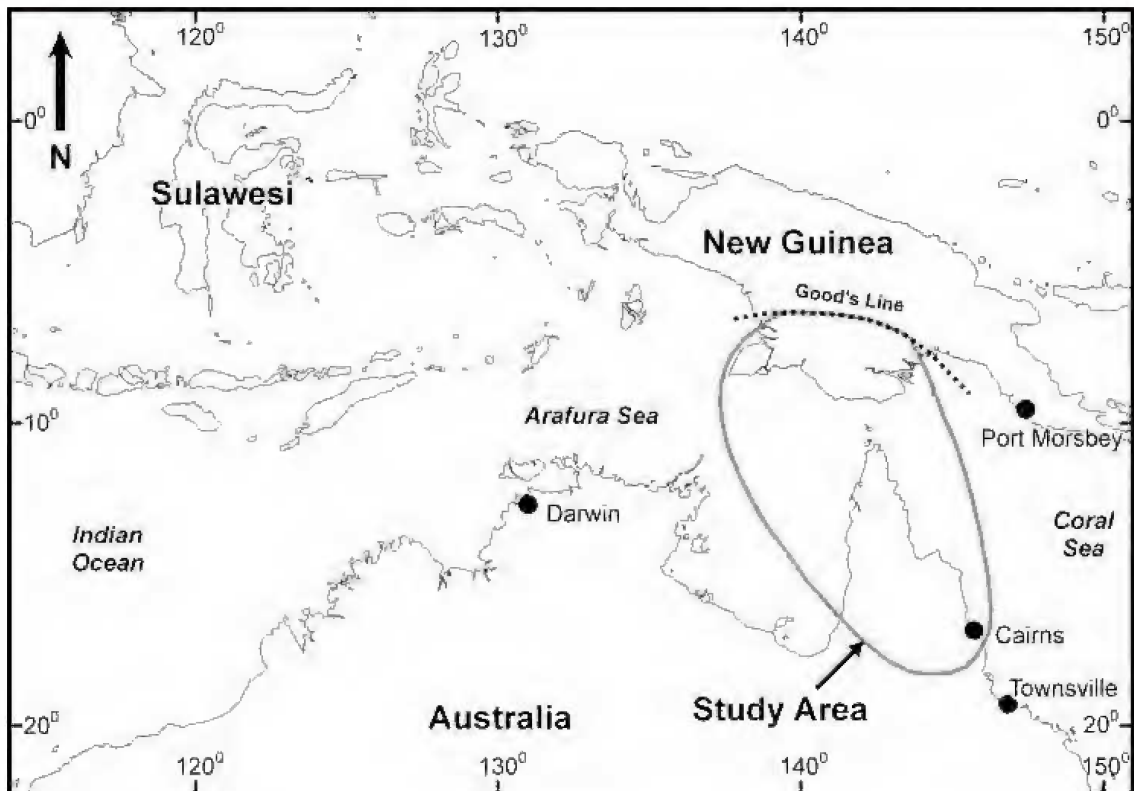


Figure 1: The study area.



Figure 2: *Nepenthes mirabilis* and expended female fruit at Sheldon Lagoon (left); Fanie Venter with *Nepenthes mirabilis* in wetland habitat (right).

collect herbarium specimens and material for DNA sequence analysis, and choose locations for ecological studies to be conducted in the 2011 Dry Season when temperatures and rainfall are lower and study sites more easily accessible. The Cape constitutes the Cape York bioregion of 127,175 km<sup>2</sup>, an area slightly less than that of England. It is renowned for its diverse flora and fauna, some of which is shared with New Guinea, and is a mecca for Australian and overseas visitors alike. Fieldwork on the Cape is always a challenge; the single access road is unsealed and often impassable during the Wet Season, *c.* mid-November through April. A four-wheel drive vehicle is a necessity, temperatures can be high, and the presence of estuarine crocodile, *Crocodylus porosus*, makes caution about swamps and at river-crossings a must.

We undertook the trip in October and early November 2010, heading north at the end of the Dry Season when water levels in swamps are lowest and most visitors are heading south to escape the impending Wet. Given the time of the year and a forecast for a heavy Wet Season the strategy adopted was to head for The Tip and work south. While *N. mirabilis* occurs in a small area south of Cairns in the Wet Tropics bioregion, *Nepenthes* on the Cape are of interest because three species, *N. mirabilis*, *N. tenax*, and *N. rowaniae*, occur there, often growing in distinct habitats but close proximity, and frequently hybridizing. In addition, several populations of *Nepenthes* of uncertain taxonomic status occur (see Clarke & Kruger 2005, 2006; Beasley 2009) and these warrant further investigation.

Australian state and national herbaria records show *N. mirabilis* has been collected widely in a number of habitats across the Cape. However, they also show *N. tenax* and *N. rowaniae* have not often been collected and are restricted to swamps and their margins north of the Jardine River in the northern most part of the Cape. We encountered the first substantial populations of *N. mirabilis* at Cockatoo Creek and nearby Sheldon Lagoon in the deep leached sands of Heathlands National Park; while we were familiar with the species from near Cairns, there was a palpable sense of excitement in seeing them in this habitat so far from home. Many plants were in flower and samples were collected and a photographic record was made (see Figure 2). From here we skirted northwards and found *N. mirabilis* in every area of suitable habitat, but the other species remained elusive until we crossed the Jardine River. We then skirted the southern margins of the Jardine and Sanamere Swamps that flood an area of >400 km<sup>2</sup> on a seasonal basis and are full of crocodiles.





Figure 3: *Nepenthes tenax*.



Figure 4: *Nepenthes rowaniae* in wetland habitat.

We continued on north to Bamaga and touched base with AQIS (Australian Quarantine Inspection Service) staff, part of a team responsible for the health of flora and fauna in the northern Cape and adjacent Torres Strait, for a briefing on local conditions. Then it was through the Lockerbie Scrub to the site of the colonial settlement of Somerset, type location of *N. rowaniae*. We were not successful in finding this species here, probably due to our unfamiliarity with its habitat requirements. However, we found huge numbers of the toxic Cane Toad, *Bufo marinus*, whose introduction to Australia has caused the diminution of so many native species of fauna; at one site they were so noisy through the night we thought we had stumbled on a Harley-Davidson convention. We were also concerned about the numbers and activities of feral pigs, *Sus scrofa*, which are ripping up extensive areas of *Nepenthes* habitat. However, *N. mirabilis* was common and we surveyed and sampled populations in open freshwater wetland and closed riverine forest habitats. Morphological, morphometric, ecological, and AFLP (amplified fragment length polymorphism) DNA data from these populations will later be compared with those from the Wet Tropics and New Guinea.





Figure 5: *Nepenthes tenax* (left) and *N. mirabilis* (right) in Sanamere Swamp.

We next headed to Sadd Point, in the far northeast of the Cape, to collect *Nepenthes* there. Previous collections from this location had been identified as *N. mirabilis*, but local botanist John Beasley had commented (Beasley 2010) that the morphology in some plants varied from those of typical *N. mirabilis*. Beasley observed that leaves of some plants retained finely hairy margins and upper pitchers with characteristics such as wings with finely serrate margins, otherwise typical of lower pitchers, through to maturity. We made several collections, including one showing a development sequence from the form commented on by Beasley through mature upper pitchers with morphology of typical *N. mirabilis*. While analysis of DNA sequence data will confirm or otherwise this, at the moment we are happy to assign all of the material to this species.

Back on the main track and just east of the ferry crossing on the Jardine River we finally encountered both *N. tenax* and *N. rowaniae* (see Figures 3 and 4) at the head of Cowal Creek in the Sanamere Swamp. The habitat here is peat over sand with a mixed vegetation of sedges and low shrubs, and is cut by numerous channels flowing away to creeks and rivers in the north and west. Huge numbers of *Nepenthes* are present and it is an exciting and awe-inspiring sight. *Nepenthes mirabilis* is most com-

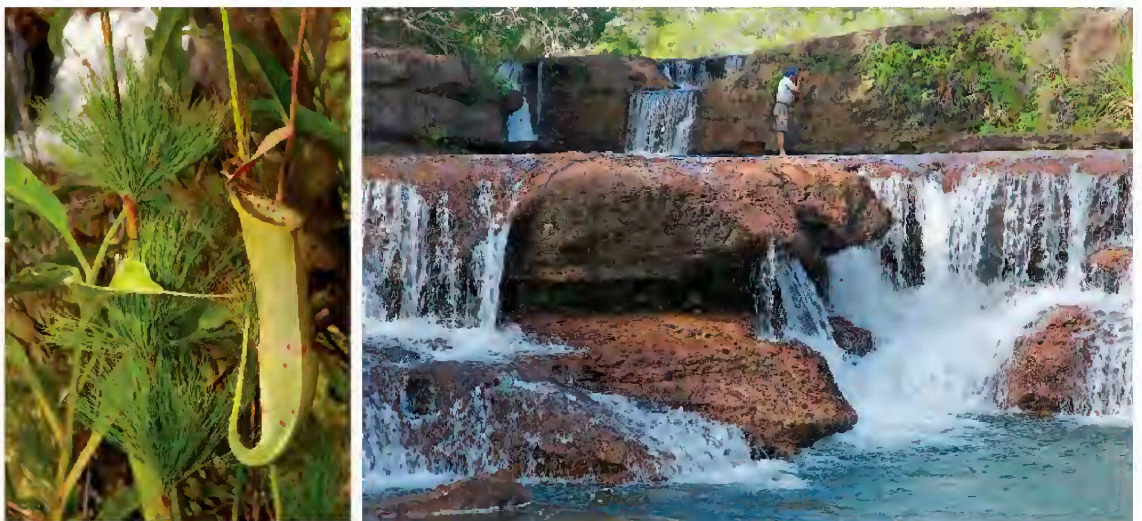


Figure 6: *Nepenthes mirabilis* at Twin Falls.



mon in slightly drier areas and *N. tenax* and *N. rowaniae* in wetter areas. While the former often has a scrambling habit and tends to climb into higher vegetation, the other two form discrete clumps and sub-shrubs. In some areas *N. tenax* and *N. mirabilis* co-occurred and in these situations the differences in the two species were quite apparent (see Figure 5). At this location, plants of each species would be submerged in water in the Wet Season and frequently subjected to wildfires during the Dry Season.

Studying *N. tenax* and *N. rowaniae* is challenging due to the difficulty in moving about in this habitat. In addition, the shade temperatures were 38 and 39°C on successive days. The sky was clear and so bright that reviewing digital images in the camera was almost impossible. The situation is further complicated as the species hybridize and we believe that several as yet undescribed entities also occur there. One of them, colloquially known as “mini-tenax”, occurs deep in the swamps and is difficult to study, as crocodiles are common in the waist deep water of their habitat.

We continued our way south, stopping to photograph *N. mirabilis* on sandstones on the edge of the water at Twin Falls (see Figure 6) and to have a much-needed swim (it is one of the few places



Figure 7: *Utricularia chrysantha*.



Figure 8: *Nepenthes* sp. juvenile lower pitcher at Steve Irwin Reserve.



Figure 9: *Nepenthes mirabilis* (upper pitcher) and Robyn Wilson with *Nepenthes mirabilis* in habitat at Tozer Gap.

on Cape York where it is safe to do so). Plants of *N. mirabilis* grew here in a narrow ecotone between water's edge and dry surrounding forest and some pitchers were held emergent from stems growing in the water. A few kilometers further south and a little further upstream at Fruit-bat Falls, in addition to *N. mirabilis* we photographed the carnivorous Sun Bladderwort, *Utricularia chrysantha* (see Figure 7) and the small, but exquisite, Straggly Rush Orchid, *Conostalix paludicola* (= *Dendrobium lobbii*).

North of Weipa, the largest town on Cape York and service centre for a local large alumina mine, we visited the Steve Irwin Research Reserve on the Wenlock River to study and sample *Nepenthes* growing in a spring at the base of a low bauxite plateau. Both *N. mirabilis* and what had been identified as *N. tenax* had previously been collected from the site and we were keen to ascertain the veracity of the latter, as by this time our experience further north suggested it was unlikely *N. tenax* would be present. The substrate at the spring was peaty sand and alluvium and supported a floristically distinct rain forest community that was in excellent condition due to the control of feral pigs by the resident ranger staff. We recollected both taxa and are of the opinion we are seeing variation in *N. mirabilis* – the second taxon (see Figure 8) has some differences in the developmental sequence of lower pitchers and additional study and the results of sequence data analysis will provide

a definitive answer – certainly it is not *N. tenax sensu stricto*.



Figure 10: *Myrmecodia beccarii* at Tozer Gap.

We worked our way south and our final destination was Tozer Gap in the Iron Range National Park on the east coast of the Cape. Here *N. mirabilis* grows on leached sand in an elevated heathland (see Figure 9). Iron Range is a mecca for both botanists and ornithologists, with a suite of species otherwise only found in New Guinea present here in the largest area of lowland rain forest in Australia, so we stopped work for a day and took in the sights. Several species of epiphytic ant plants (*Myrmecodia*



and *Hydnophytum*) were present and, although not carnivorous, were of interest because colonies of ants and sometimes the larvae of *Theclinessthes* butterflies live in them. These ant plants are in the Rubiaceae and we were delighted to find several plants of *Myrmecodia beccarii* in flower and fruit (see Figure 10), the small aromatic white flowers and red-coloured fleshy berries being remarkably similar to those of *Coffea* (coffee), also in the Rubiaceae.

Back in Cairns and with the specimens in the drier, tissue samples collected to silica gel archived for later analysis, and images and morphometrics datasets backed up on the hard drive, we had time to consider what we had accomplished. In three weeks we had travelled 3000 kilometers, dodged the descending Wet, surveyed and sampled populations of three species across a range of habitats, re-sampled a population of dubious taxonomic status, and substantially expanded our knowledge of the ecology of *Nepenthes* in Cape York.

Our initial impressions are that *N. mirabilis* is morphologically variable and occupies a broader ecological niche and occupies a much wider area than the other two named taxa; that accessing additional populations and conducting ecological studies of *N. rowaniae* and *N. tenax* is going to be challenging, and that more work is required to determine the status of the undetermined taxa. Only after this work is completed will we extend our activities to similar habitats across Torres Strait on the island of New Guinea.

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